ASME SECTION XI
Task Group on In-service Inspection of Spent Fuel Storage and Transportation Containments

Kenn Hunter - Exelon
Task Group Chairman

US NRC 28th Annual Regulatory Information Conference (RIC)

March 8, 2016

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NRC REQUEST

Highlights

- Request ASME standards committee to take actions necessary to establish Code rules for in-service inspection of dry storage systems for spent nuclear fuel.
- Specifically requesting development of the following requirements for metallic pressure-retaining storage canisters and transfer casks:
  - ❑ Examination and inspection, including
    - ✓ applicable techniques
    - ✓ sampling / frequency protocol
    - ✓ demonstration methodology
    - ✓ qualification standards
  - ❑ Acceptance standards, including
    - ✓ flaw evaluation procedures
    - ✓ corrosion/degradation assessment methodologies
- To date, NRC has evaluated aging management activities using power reactor inspection criteria in the ASME Code and other standards to the extent practical. However, the reactor standards are not fully applicable to spent nuclear fuel storage systems.
- If the proposed ASME Code requirements are found acceptable to the NRC, they will be referenced in our guidance or regulations.

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TG CHARTER

TASK GROUP ON ISI OF SPENT NUCLEAR FUEL STORAGE AND TRANSPORTATION CONTAINMENT SYSTEMS (BPV XI)

The Task Group is responsible for developing and proposing Code Revisions and Code Cases for Inservice Inspection of spent nuclear fuel storage and transportation containment systems for Section XI, Division 1 of the ASME Boiler and Pressure Vessel Code. The Task Group will develop and coordinate changes to the Code that address examination, evaluation of examination results, and repair/replacement activity requirements for metallic portions of the spent nuclear fuel storage and transportation containment systems. The Task Group shall refer potential Code actions to the appropriate Subgroups as needed, and will report to the BPV XI Executive Committee.

Note: This is a 5 year initiative

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ASME TASK GROUP

First Meeting in Colorado Springs - April 27, 2015

Presentations/Discussions:

- Agreed to meet quarterly for 4 hours on Monday morning of ASME Week
- Chair and Secretary (Aparna Alleshwaram) established
- Members established (32 members)
- NRC Presentation on need for inspection requirements
- Decided to use N770 as a template for this code case

Members -

Doug Ammerman
Bill Borter
John Broussard
Steve Brown
Charles Bryan
Terry Carraher
Al Csontos
Darrell Dunn
Roy Folley
Brian Gutherman
Abraham Hinojosa
Stuart Horowitz
Mark Joseph
Andy Jung
Michael Liu
Ryan Meyer
Ben Montgomery
Mike Moran
Lloyd Morrell
Tim Nuoffer
Mike Orihuela
Raymond Pace
Ed Pleins
Bob Sindelar
Howard Smith
Jack Spanner
Charles Temus
Glenn White
John Wise
John Zhai

(3) EPRI
(6) Cask Vendors
(4) National Labs
(6) Utilities
(4) NRC
(8) Eng. Consultants
(1) ASME

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TASK GROUP MEETINGS

Second Meeting in San Francisco – August 03, 2015

Presentations/Discussions:

- Cask vendors (Holtec, AREVA/TN, NAC, Energy Solutions) presentations on different types of casks.
- EPRI presentation on status of EPRI work and Failure Modes Effects Analysis (FMEA)/degradation mechanisms
- NRC/ Pacific Northwest National Lab (PNNL) presentation on limits of inspections on various systems
- Assigned Code Case Subgroups

Case N-XXX
Examination Requirements and Acceptance Standards for Spent Fuel Storage and Transportation Canisters

Section ??, Division ??

Inquiry: What alternative requirements may be used for qualification requirements for the examination of Spent Fuel Storage and Transportation Canisters?

Reply: It is the opinion of the Committee that as an alternative to the requirements of ??????????, the following requirements may be used.

-1000 SCOPE AND RESPONSIBILITY

-1100 SCOPE

This is the section for the Scope of the Code Case.

-1200 COMPONENTS SUBJECT TO EXAMINATION

-1210 Examination Requirements

The examination requirements shall apply to the following:

2.1 General

(a) Specimens shall have
(b) For examinations performed from
(c) For each examination technique
(d) The specimen set shall contain
(e) The specimen set shall include
f) The qualification specimens shall be austenitic stainless steel.

Section 1200: Examination Requirements – Brian Gutherman
Section 2000: Examination and Inspection – Mike Orihuela
Section 2400: Inspection Schedule – Mike Lui
Section 3000: Acceptance Standards – Aparna Alleshwaram
Section 4000: Repair/Replacement Activities – Low Priority

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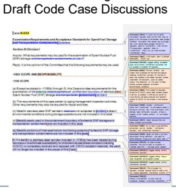
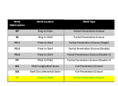
TASK GROUP MEETINGS

Third Meeting in Atlanta – November 03, 2015

Presentations/Discussions:

- EPRI presentation on Non Destructive Examination (NDE) Activities and Palo Verde Robotics Demonstration
- Sandia National Labs (SNL) presentation on Probabilistic Performance Assessment: Stress Corrosion Cracking of Spent Nuclear Fuel Interim Storage Canisters
- SNL presentation on Measured Weld Residual Stresses on a Full-Diameter Cylindrical Canister Mockup
- Structural Integrity Associates (SIA) presentation on Lessons Learned from Stress Corrosion Cracking in BWR and PWR components
- Draft Code Case Discussions





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TASK GROUP MEETINGS

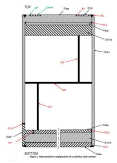
Fourth Meeting in Las Vegas – February 15, 2016

Presentations/Discussions:

- Weld Residual Stress Finite Element Analysis of Stainless Steel Canisters and CISCC Flaw Characteristics"
- Example AMP from NUREG 1927, Rev 1
- Coordination of Non-Destructive Examination activities during Fabrication, Pre-service and future inspections
- Discussion and Comments on Representative Canister Drawing
- Draft Code Case Discussions

Future Discussions/Considerations

- Continue Sub-Group Meetings
- Focus on draft code case sections
- Items for further consideration:
  - Area(s) of concern (weld, Heat Affected Zone (HAZ), surface area)
  - Fabrication vs. Aging indications
  - Deployment of appropriate NDE tools for Visual and Volumetric Examinations
  - Inaccessible areas



LIST OF ACRONYMs

ASME – American Society of Mechanical Engineers
NRC - Nuclear Regulatory Commission
BPV - Boiler and Pressure Vessel
EPRI - Electric Power Research Institute
PNNL – Pacific Northwest National Lab
SNL - Sandia National Labs
BWR – Boiling Water Reactor
PWR – Pressurized Water Reactor
SIA - Structural Integrity Associates
NUREG – US NRC Regulation
NDE - Non Destructive Examination
HAZ - Heat Affected Zone
AMP - Aging Management Programs